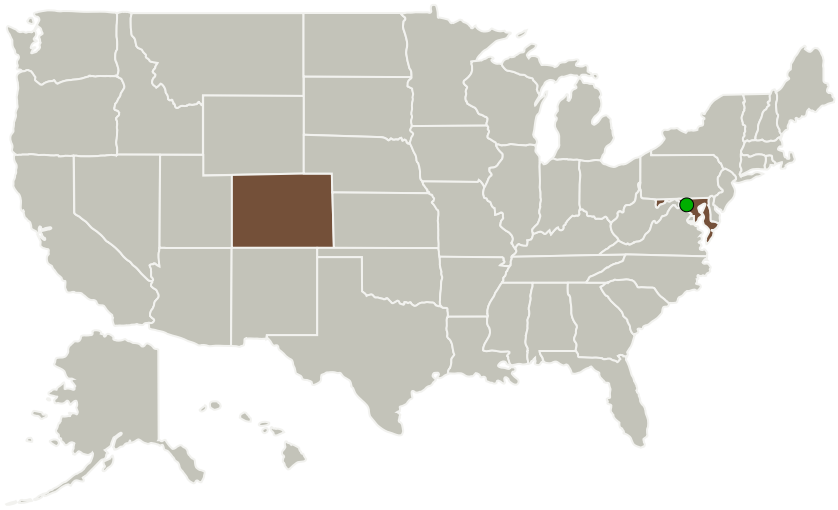
Efficient On-board Lamberts Solution for DSM, Phase I

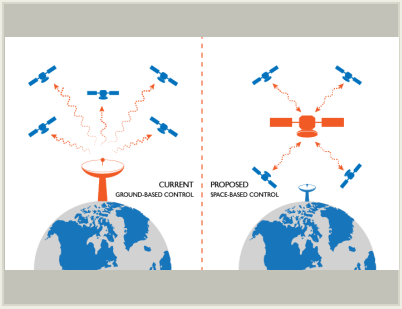
Completed Technology Project (2017 - 2018)

Project Introduction

Distributed Spacecraft Missions (DSMs) such as constellations, formation-flying missions, and fractionated missions provide unique scientific and programmatic benefits. Distributed mission architectures allow for multipoint in-situ measurements, multi-angle viewpoints, and considerably improved understanding of the connections between separately measured phenomena and their time variations. DSMs are particularly important for NASA's efforts to better understand Sun-Earth interactions, space weather, and heliophysics, and they deliver operational and scientific benefits for missions to small bodies and planetary satellites as well. In all cases these missions impose unique operational requirements that can stress ground tracking stations and mission operators by increasing the number of vehicles or create challenges when establishing sufficient communications contacts. These DSM challenges can be addressed by employing automation both on board and on the ground. Moving autonomous operations on board the spacecraft mitigates both the operational burden of such missions as well as the ground segment congestion faced in these scenarios. Advanced Space proposes developing a real-time (RT), open source, embedded software (ESW) application for on-board maneuver planning and relative orbit determination that is compatible with NASA's Core Flight System (cFS) and that enables DSMs to operate with increased autonomy in their spacecraft operations. In combination with cFS, an on-board software engine capable of employing a linearized solution of Lambert's problem will yield a powerful and enabling application for a wide variety of missions using distributed spacecraft arrangements.

Primary U.S. Work Locations and Key Partners





Efficient On-board Lamberts Solution for DSM, Phase I Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
Advanced Space, LLC	Lead Organization	Industry	Boulder, Colorado
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
University of Colorado Boulder	Supporting Organization	Academia	Boulder, Colorado

Primary U.S. Work Locations	
Colorado	Maryland

Project Transitions

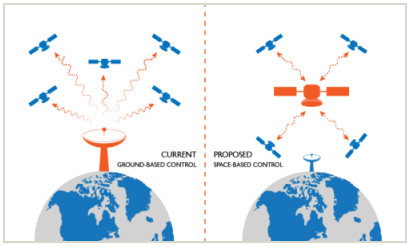
June 2017: Project Start

June 2018: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140841)*

Images



Briefing Chart Image
Efficient On-board Lamberts Solution for DSM, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/131661)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Advanced Space, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

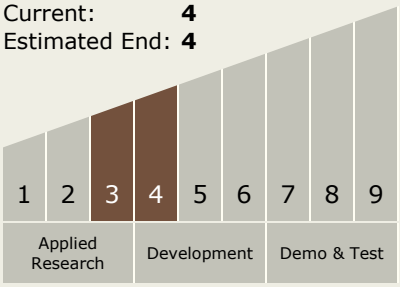
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Jay Mcmahon

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.1 Software Development, Engineering, and Integrity
    - TX11.1.1 Tools and Methodologies for Software Design and Development

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System